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R&D related to the High Power Superconducting Proton Linac (HP-SPL)

Following the decision of the CERN management in 2010 to base the future of the LHC injector complex on the replacement of Linac2 by Linac4 and on the upgrade of all the other accelerators, the R&D for a Superconducting Proton Linac (SPL) was oriented towards high power applications. Until the end of 2014, this activity is aimed at the design, construction and test of a 4 cavity cryomodule, linked with the upgrade of the CERN infrastructure for superconducting RF to the present state-of-the-art standards. It takes place in collaboration with the European Spallation Source (ESS) project which will be built in Lund (Sweden). and it is supported by the French CEA and CNRS in the context of an in-kind contribution to CERN. After the year 2014, numerous subjects could be investigated [e.g. getting reproducibly the required gradient, reducing cost by investigating different fabrication techniques (Nb deposition on Cu), designing a full size 8 cavity cryomodule and/or investigating alternative high power RF sources]. The precise goals will have to be adapted to the results of the first phase of R&D and to the updated scientific strategy of CERN.

The SPL R&D can be directly used in future projects which require a high power proton driver, like neutrino or radioactive ion beam facilities. It could also be used in the renovation of LHC injectors, for example in the context of HE-LHC.
Beyond these possible applications, this R&D serves to update CERN competencies and infrastructure for superconducting RF (e.g. SM18 clean room, High Power RF, High Pressure Water Rinsing facility, Diagnostics for superconducting RF cavities, New e-beam welding machine, Electro-polishing installation, etc.). It is also of interest for a number of other options which depend upon the extensive use of superconducting RF systems to accelerate leptons, like LHeC and LEP-3. A prototype ERL could for example be assembled using the cryomodule(s) and RF system(s) built in the context of the SPL R & D.

This activity is presently supported every year with approximately 1.7 MCHF (CERN material budget) and 6 FTE. It benefits also from miscellaneous contributions (French in-kind, EU programmes like EUCARD and CRISP) and from the ESS-CERN collaboration. That amount of support is necessary for pursuing R&D at a level which preserves the core competence and capability on which a future construction project would rely.

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